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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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| 10/728,987 | 12/08/2003 | Akiharu Miyanaga | 740756-2681 | 1100 |
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| NIXON PEABODY, LLP 401 9TH STREET, NW SUITE 900 WASHINGTON, DC 20004-2128 | | | EXAMINER MARKHAM, WESLEY D | |
| | | | ART UNIT | PAPER NUMBER |
| | | | 1762 | |

DATE MAILED: 12/09/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/728,987

Applicant(s)

MIYANAGA ET AL.

Examiner

Wesley D Markham

Art Unit

1762

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 30 August 2004 and 28 September 2004.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 2-20 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 2-20 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 30 August 2004 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☒ Certified copies of the priority documents have been received in Application No. 08/426,483.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- ☒ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 8/30/04.
- ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- ☐ Notice of Informal Patent Application (PTO-152)
- ☐ Other: _____

DETAILED ACTION

Response to Amendment

1. Acknowledgement is made of the amendments filed by the applicant on 8/30/2004 and 9/28/2004, in which the specification of the instant application, including the title and the abstract, was amended, four (4) sheets of replacement drawings were submitted, Claim 1 was canceled, and Claims 2 – 20 were added. **Claims 2 – 20** are currently pending in U.S. Application Serial No. 10/728,987, and an Office Action on the merits follows.

Information Disclosure Statement

2. The IDS filed by the applicant on 8/30/2004 is acknowledged, and the references listed thereon have been considered by the examiner as indicated on the attached copy of the PTO-1449 forms.

Drawings

3. The objections to the drawings, set forth in paragraph 4 and 6 of the previous Office Action (i.e., the non-final Office Action mailed on 4/12/2004), are withdrawn in light of the replacement sheets of drawings submitted by the applicant on 8/30/2004, in which (1) the axes of Figures 3A, 3B, 3C, 4, 6A, 6B, and 6C were appropriately labeled, and (2) reference character "30" in Figure 1 was changed to "38".
4. However, the newly filed drawings are still objected to as failing to comply with 37 CFR 1.84(p)(5) because they include the following reference character(s) not mentioned in the description: "12", "13", "22", "23", "24", and "38" in Figure 1, and "29" in Figure 5. Corrected drawing sheets in compliance with 37 CFR 1.121(d), or

amendment to the specification to add the reference character(s) in the description in compliance with 37 CFR 1.121(b) are required in reply to the Office Action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office Action. The objection to the drawings will not be held in abeyance.

Specification

5. The objections to the specification, set forth in paragraphs 7 – 9 of the previous Office Action, are withdrawn in light of the applicant's amendments to correct the title of the invention, abstract of the disclosure, and various typographical errors.

Claim Observations

6. To begin, the examiner notes that the objections and rejections of Claim 1, set forth in paragraphs 10 – 22 of the previous Office Action, are withdrawn in light of the applicant's amendment to cancel Claim 1.
7. The examiner would also like to note that, for purposes of examination and in light of the applicant's specification, the limitation, "...is superposed on" in independent

Claims 2, 4, 6, 8, 10, 13, 16, and 18 has been interpreted to exclude situations in which a pulsed or continuous wave is simply applied to a substrate (e.g., as a pulsed or continuous bias voltage/power) and a separate continuous or pulsed wave is simply used to generate the plasma. In this aforementioned situation, the waves have not been interpreted to be "superposed on" each other as required by the applicant's claims.

Claim Objections

8. Applicant is advised that should Claim 17 be found allowable, Claim 20 will be objected to under 37 CFR 1.75 as being a substantial duplicate thereof. When two claims in an application are duplicates or else are so close in content that they both cover the same thing, despite a slight difference in wording, it is proper after allowing one claim to object to the other as being a substantial duplicate of the allowed claim. See MPEP § 706.03(k).

Claim Rejections - 35 USC § 112

9. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

10. **Claims 8, 9, and 17 – 20** are rejected under 35 U.S.C. 112, first paragraph, because the specification, while being enabling for superposing a continuous electromagnetic

wave on a pulsed electromagnetic wave in the art of depositing a film by plasma CVD, wherein the power value of the pulsed electromagnetic wave is higher than the power value of the continuous electromagnetic wave (see applicant's Figures 3A and 3B), does not reasonably provide enablement for broadly superposing a continuous electromagnetic wave on a pulsed electromagnetic wave in general in a plasma CVD film formation process, as Claims 8, 9, and 17 – 20 are open to. The specification does not enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to use the invention commensurate in scope with these claims. Specifically, Claims 8, 9, and 17 – 20 broadly require superposing a continuous electromagnetic wave on a pulsed electromagnetic wave in a method for forming an insulating ceramic film or a metallic film. However, the applicant has only disclosed such a process in which the power value of the pulsed electromagnetic wave is higher than the power value of the continuous electromagnetic wave (see applicant's Figures 3A and 3B). One skilled in the art would not be able use a continuous electromagnetic wave having a greater power value than a pulsed electromagnetic wave in such a film formation process without undue experimentation because this process is not described at all by the applicant, or the state of the art in general. In addition and to support this position, the examiner notes that such a process would not appear to work because the higher-power continuous wave would "drown out" the pulsed wave, and no pulse or spike would be seen as shown by the applicant in Figures 3A and 3B.

11. **Claims 8, 9, and 17 – 20** are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter that was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Specifically, newly added Claims 8, 9, and 17 – 20 broadly require superposing a continuous electromagnetic wave on a pulsed electromagnetic wave in a method for forming an insulating ceramic film or a metallic film. However, the applicant has only disclosed such a process in which the power value of the pulsed electromagnetic wave is higher than the power value of the continuous electromagnetic wave (see applicant's Figures 3A and 3B). There is no discussion or disclosure, either implicit, explicit, or inherent, in the applicant's originally filed specification of a process in which the power value of the continuous wave is the same as or higher than the power value of the pulsed wave. Since newly added Claims 8, 9, and 17 – 20 are clearly intended by the applicant to encompass such a situation (see Claims 2 – 7 and 10 – 16, all of which explicitly recite that the power value of the pulsed wave is higher than the power value of the continuous wave, in contradistinction to Claims 8, 9, and 17 – 20, which lack such a limitation), the scope of Claims 8, 9, and 17 – 20 clearly extends beyond the scope of the originally disclosed invention. As such, the claims encompass subject matter that was not described in the specification in such a way as to convey to one skilled in the art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

Double Patenting

12. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and, *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969). A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b). Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

13. **Claims 2 – 20** are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over Claims 1 – 9 and 11 – 14 of U.S. Patent No. 6,660,342 (Miyanaga et al.). Although the conflicting claims are not identical, they are not patentably distinct from each other because Claims 1 – 9 and 11 – 14 of U.S. Patent No. 6,660,342 teach each and every limitation of Claims 2 –

20 of the instant application, including the steps of introducing a reactive gas into a reaction chamber, applying a pulsed EM wave (e.g., microwave) to the reactive gas to convert the gas into a plasma, applying a continuous EM wave to the reactive gas so that the continuous EM wave is superposed on the pulsed EM wave, and forming a film on a surface of an object in the reaction chamber, wherein (1) a power value of the pulsed EM wave is greater than a power value of the continuous EM wave, (2) the frequency of the pulsed EM wave is either the same as or different from the frequency of the continuous EM wave, and (3) a magnetic field is applied to perform ECR in the chamber. The method of Claims 1 – 9 and 11 – 14 of U.S. Patent No. 6,660,342 is used to produce films of materials such as aluminum oxide and zirconia (i.e., “insulating ceramic films”, as required by Claims 2 – 9), as well as films of a material selected from the group consisting of tungsten, titanium, and molybdenum, and a silicide thereof (i.e., “metallic films”, as required by Claims 10 – 20) (see Claims 2, 4, 5, 7, 8, 12, and 13 of 6,660,342 for the appropriate film material teachings). By carrying-out the process reasonably suggested by Claims 1 – 9 and 11 – 14 of U.S. Patent No. 6,660,342, one of ordinary skill in the art would also have carried-out the process of Claims 2 – 20 of the instant application, and as such, Claims 2 – 20 are not patentably distinct from Claims 1 – 9 and 11 – 14 of U.S. Patent No. 6,660,342.

14. **Claims 2 – 20** are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over Claims 1 – 15 of U.S. Patent No.

5,626,922 (Miyanaga et al.). Although the conflicting claims are not identical, they are not patentably distinct from each other because Claims 1 – 15 of U.S. Patent No. 5,626,922 teach a “plasma processing” method including the steps of introducing a reactive gas into a reaction chamber, applying a pulsed EM wave (e.g., microwave – see Claims 2 and 9) to the reactive gas to convert the gas into a plasma, and applying a continuous EM wave to the reactive gas so that the continuous EM wave is superposed on the pulsed EM wave, wherein (1) a power value of the pulsed EM wave is greater than a power value of the continuous EM wave, and (2) the frequency of the pulsed EM wave is different from the frequency of the continuous EM wave (see Claims 9, 12, and 15). While independent Claims 9, 12, and 15 do not explicitly teach that the “plasma processing” includes depositing an insulating ceramic film or a metallic film on a substrate in the chamber, Claims 3 and 4 of 5,626,922 clearly teach that such a plasma film (e.g., metallic or insulating ceramic) forming process is considered to be within the genus of “plasma processing” envisioned by Claims 1 – 15 of 5,626,922. Therefore, it would have been obvious to one of ordinary skill in the art to utilize the method recited in Claims 9, 12, and 15 of 5,626,922 to deposit an oxide (i.e., insulating ceramic) or tungsten, titanium, or molybdenum (i.e., metallic) film, as taught by Claims 3 and 4, because such a plasma film deposition process fulfills the generic “plasma processing” requirement of Claims 9, 12, and 15 in a manner clearly envisioned by the claims of 5,626,922. Claim 8 of '922 also teaches that a pulsed magnetic field is applied to the chamber, and as such, it would have been obvious to one of ordinary skill in the art to apply

such a field in order to promote the plasma processing of the substrate (i.e., due to the resonance – ECR – conditions achieved by pulsing a magnetic field in a plasma process). Regarding the limitation that the frequencies of the pulsed EM wave and the continuous EM wave are the same (as required by Claims 6, 7, and 16 of the instant application), the claims of 5,626,922 appear to be open to both situations in which the frequencies are the same and in which the frequencies are different. As such, absent any showing of criticality or unexpected results, it would have been obvious to one of ordinary skill in the art to utilize either the same frequency or different frequencies for the pulsed and the continuous EM waves with the reasonable expectation of success and obtaining similar results. By carrying-out the process reasonably suggested by Claims 1 – 15 of U.S. Patent No. 5,626,922 (see the discussion above), one of ordinary skill in the art would also have carried-out the process of Claims 2 – 20 of the instant application, and as such, Claims 2 – 20 are not patentably distinct from Claims 1 – 15 of U.S. Patent No. 5,626,922.

Response to Arguments

15. Applicant's arguments filed on 8/30/2004 have been fully considered but they are not persuasive. Specifically, the applicant's arguments are moot in view of the new grounds of rejection presented above.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Ikegaya et al. (JP 61-253369 A) teaches a method of coating an article by plasma CVD in which a high-frequency power source such as a microwave power source is used in combination with a DC power source as a plasma excitation source. However, a DC power source (as taught by Ikegaya et al.) is not equivalent to an "electromagnetic wave", and, in addition, the DC power source of Ikegaya et al. is not pulsed, and Ikegaya et al. does not teach the relative power values of the microwave power source and the DC power source. Corn et al. (USPN 4,585,516) teaches a process for operating a parallel-plate plasma reactor in which one plate is connected to a source of a high frequency signal, and the second plate is connected to a source of a low frequency signal. Either signal can be continuous or pulsed. However, the process of Corn et al. is an etching process, not a deposition process, and the power value of the pulsed electromagnetic wave is not higher than the power value of the continuous electromagnetic wave, as required by the applicant's claims. Further, since each electromagnetic wave of Corn et al. is supplied to a different "plate", the waves are not superposed on each other, as required by the applicant's claims. Doki et al. (USPN 5,231,057) teaches a plasma CVD process in which a continuous or pulsed RF wave is supplied to an electrostatic chuck in order to bias a substrate, and a continuous or pulsed microwave is applied to form a plasma from a reactive gas. However, since one wave is applied to the substrate and the other wave is applied to the reactive gas in the process of Doki et al., the waves are not "superposed on" each

Art Unit: 1762

other, as required by the claims. Matsuo et al. (JP 63-80540 A) teaches a plasma apparatus and plasma CVD method in which the microwave power used to generate a stable plasma can be either intermittent (i.e., pulsed) or continuous. However, the aforementioned microwaves are not "superposed on" each other, and the relative power value of the pulsed and continuous microwaves is not taught by Matsuo et al. Yau et al. (USPN 4,837,185) teaches a plasma CVD process for depositing a thin SiON film on a substrate in which a high frequency EM wave pulse and a low frequency EM wave pulse are superposed on each other (see Figure 3B). However, neither pulse is continuous, and Yau et al. does not teach the relative power value of the two pulses.

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office Action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Wesley D Markham whose telephone number is (571) 272-1422. The examiner can normally be reached on Monday - Friday, 8:00 AM to 4:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Shrive Beck can be reached on (571) 272-1415. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



WDM

Wesley D Markham
Examiner
Art Unit 1762



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